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July 9, 2007

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

Re: *Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band - IB Docket No. 95-91, GEN Docket No. 90-357, RM-8610* – WRITTEN EX PARTE COMMUNICATION

Dear Ms. Dortch:

I am writing on behalf of the WCS Coalition[1] to supplement our prior response to the "Petition for Rulemaking, and Comments" filed by Sirius Satellite Radio Inc. ("Sirius") proposing amendments to Parts 25 and 27 of the Commission's Rules to govern the operation of satellite Digital Audio Radio Service ("DARS") terrestrial repeaters and Wireless Communications Service ("WCS") systems in the 2305-2360 MHz band (the "Sirius Petition").[2] More specifically, after careful review of Sirius' proposal and empirical testing, we believe that certain revisions are required to establish a regulatory environment that reasonably provides for the coexistence of the two services in adjacent spectrum and that enables the WCS community to fulfill its obligations to aggressively deploy services in the 2.3 GHz band. Attached hereto as Exhibit A is the WCS Coalition's proposed amendments to Parts 25 and 27 of the Federal Communications Commission's (the "Commission") Rules.[3]

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[1] The WCS Coalition is comprised of AT&T Inc., Comcast Corporation, NextWave Broadband Inc., and Sprint Nextel Corporation, who collectively hold virtually all of the 2.3 GHz WCS spectrum within the fifty United States, and the Wireless Communications Association International, Inc.

[2] Petition of Sirius Satellite Radio Inc. for Rulemaking, and Comments, IB Docket No. 95-91 (filed Oct. 17, 2006) ["Sirius Petition"].

[3] Exhibit A merely addresses technical rules for DARS terrestrial repeaters. However, the WCS Coalition does not object to the proposal by Sirius for blanket licensing of terrestrial DARS repeaters or for limiting DARS terrestrial service to retransmission of satellite programming. *See* Sirius Petition at A-1 and A-2(proposed Sections 25.214(d)(1) and (5)A).

At the outset, it must be stressed that the rules proposed herein are not the optimum from the perspective of WCS licensees. Rather, this proposal reflects a good faith effort by the WCS Coalition at crafting a compromise designed to end the long-running debate over WCS/DARS coexistence that has frustrated licensees in both services, as well as the Commission, for close to a decade. Sirius has acknowledged that DARS must be "willing to accept a level of interference that could significantly compromise" its service.[4] Similarly, we recognize that because WCS and DARS are fundamentally different and largely incompatible services, the final rules will of necessity have to reflect compromise by both services. As such, the members of the WCS Coalition understand both that they cannot have absolute protection against interference and that they will have to make significant operational and economic sacrifices to provide reasonable interference protection to DARS. As the WCS Coalition has previously noted, however, rules can be crafted to limit the inevitable interference without jeopardizing the ability of both WCS and DARS to reasonably serve the public.[5] The proposed rules set forth in Exhibit A reflect the WCS Coalition's effort to achieve such a result based on a careful review of Sirius' filings, as well as significant theoretical analysis, laboratory testing and field testing.

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[4] Sirius Petition at 5. The WCS Coalition is troubled that XM Radio Inc. ("XM") has taken a much less helpful position, asserting that "[t]he final rules should be careful not to allow harmful interference to satellite radio users." *See* Letter from Bruce D. Jacobs to Marlene H. Dortch, IB Docket No. 95-91, at 2 (filed Jan. 5, 2007). Suffice it to say, at least for present purposes, that the Commission has recognized that DARS licensees are not entitled to absolute protection against interference from WCS. *See Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service ("WCS"),* Memorandum Opinion and Order, 12 FCC Rcd 3977, 3991 (1997) ["WCS Reconsideration Order]("a desire for an interference-free radio service must be balanced with the need to provide reasonable operating parameters for adjacent services. Accordingly, our intention in determining out-of-band emission limits for WCS into the spectrum used by DARS has been to limit the potential for interference to a reasonable level -- not to provide a pure, interference-free environment."). The Commission has consistently rejected claims by DARS for excessive protection from possible interference, and should do so again here if XM continues to over-reach. *See, e.g. Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems,* Seventh Report and Order, 19 FCC Rcd 21350, 21374 (2004); *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems,* Memorandum Opinion and Order and Further Notice of Proposed Rule Making, 18 FCC Rcd 3857, 3898-3907 (2003); *Amendment of Part 15 of the Commission's Rules Regarding Spread Spectrum Devices*, Second Report and Order, 17 FCC Rcd 10755, 10766-67 (2002).

[5] *See* Letter from Paul J. Sinderbrand to Marlene H. Dortch, IB Docket No. 95-91, at 2 (filed Nov. 7, 2006) ["WCS Initial Response"].

The Proposed Power Limits And General Spectral Mask Are Consistent With Sirius' Call For Similar WCS And DARS Rules

In developing this compromise proposal, the WCS Coalition has attempted, at least conceptually, to hew to many of the fundamental principles espoused in the Sirius Petition. Perhaps most significantly, we agree with Sirius that coexistence of WCS and DARS terrestrial repeaters is best promoted by rules that impose "equal and mutual obligations upon both services."[6] Although some differences between the final WCS and DARS rules are inevitable given the inherent differences between the services (WCS is deploying cellularized two-way wireless broadband service, and DARS is deploying a one-way broadcast service), the drafting of this proposal was informed by the overarching objective that the rules be as consistent as possible between the two services.

To implement the objective of providing mutuality, and in the spirit of compromise, the rules proposed by the WCS Coalition would allow licensees in both services to operate at power levels up to 2,000 Watts *average* Equivalent Isotropically Radiated Power ("EIRP").[7] As is a

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[6] Sirius Petition at 2.

[7] This proposal is in lieu of Sirius' overly complex proposal that the Commission limit "average power level" to -44 dBm (100 dBμV/m) measured at 2 meters above ground level at any distance beyond the radiation center height above ground level from the base of a WCS base station or DARS repeater antenna, except that within the area, as measured from the base of the station, between (i) the radiation center height above ground level and (ii) 5000 meters, each licensee may designate and identify up to 20,000 square meters, with no contiguous area greater than 8,000 square meters, where such station shall not exceed an average power level of -32 dBm (112 dBμV/m) measured at 2 meters above ground level. *See* Sirius Petition at Appendices A and B. The WCS Coalition opposes adoption of this approach, one that is unlike anything applied to any service similar to WCS.

First, Sirius has correctly recognized that the rules be "simple to administer and maximize flexibility in system design." Sirius Petition at 6. We agree, and believe that the best way to accomplish that objective is through the simple expedient of limiting EIRP and imposing appropriate spectral masks. Particularly in light of the inherent variability of power flux density readings over time and space due to changes in fading conditions, the Sirius proposal is just too difficult to implement and to verify. Moreover, the metrics proposed by Sirius lack sufficient specificity to be meaningful. If the dBm metric is to be utilized, it is essential that measurement bandwidth, antenna gain and antenna aperture be specified – again, complicating any rule.

In addition, Sirius' proposed -44 dBm (100 dBμV/m) ground level emission restriction would effectively preclude the introduction of the very WiMAX systems based on the IEEE 802.16-2005 standard that the Commission has sought to promote in the WCS band. *See Consolidated Request of the WCS Coalition For Limited Waiver of Construction Deadline for 132 WCS Licenses*, Order, 21 FCC Rcd 14134, 14141-42 (2006) ["*WCS Extension Order*"]. It is obvious why Sirius' proposed restriction would be acceptable to the DARS licensees – they operate one-way broadcast systems with transmission antennas that tend to be mounted relatively far above ground and have minimal downtilt. By contrast, the nature of the WiMAX systems contemplated for the WCS band requires a very different network design. With

matter of record before the Commission, the WCS Coalition has consistently advocated that DARS terrestrial repeaters be limited to 2,000 Watts *peak* EIRP, which is the same restriction faced today by WCS licensees.[8] The DARS licensees, however, have pressed aggressively for the use of average power measurement to govern their operations. Our accommodation to DARS represents a willingness on the part of the WCS community to accept at least 6 dB more, and perhaps much more, interfering power from DARS terrestrial repeaters.[9]

WiMAX (or any other two-way cellularized service) base stations will tend to be relatively low to the ground and to utilize significant downtilt to facilitate spectrum reuse and assure ubiquitous coverage. While these base stations usually transmit at far lower power levels than DARS repeaters, the lower height and downtilt factors make it difficult for WCS to meet Sirius' proposed ground level restrictions. Thus, the WCS Coalition believes that the better approach to regulating WCS and DARS is to govern EIRP without regard to any ground signal limit.

Similarly, WiMAX subscriber equipment will, by its very nature, be located in very close proximity to the ground. WiMAX subscriber equipment must transmit reasonable power levels (in the range of several hundred milliwatts) to ensure two-way communication with a base station. A limit of -44 dBm measured as Sirius proposes (at one meter from the subscriber equipment antenna) would restrict that WCS subscriber equipment's transmit power to about *0.4 milliwatts*, at best (assuming a 0 dBi antenna and 5 MHz measurement bandwidth), and thus make a two-way system technically infeasible. As a point of comparison, unlicensed devices in the 2.4 GHz band are permitted to transmit at substantially higher power levels. *See* 47 C.F.R. §15.247(b)(3).

[8] *See, e.g.* Letter from William Wiltshire, Counsel to AT&T Wireless Services, to Magalie Roman Salas, Secretary, FCC, IB Docket No. 95-91, at 2 (filed Feb. 20, 2001)("ATTWS submits that the Commission should not grant the unprecedented blanket license for high power repeaters that the SDARS licensees have requested; rather, *it should adopt a blanket authorization for standard power transmitters -- operating under the same maximum power levels applicable to WCS – with a notice requirement.* Any high power repeaters should be coordinated with all affected WCS licensees on a site-by-site basis before licensing. Such a regime will achieve an appropriate balance by protecting the integrity of the WCS licenses while still affording the SDARS licensees substantial flexibility in deploying their repeater networks.")(emphasis added); Letter from William Wiltshire, Counsel to AT&T Wireless Services, to Magalie Roman Salas, Secretary, FCC, IB Docket No. 95-91, at 8 (filed April 30, 2001)("the rule would limit SDARS repeaters to peak EIRP levels of no more than 400 W/MHz, evenly distributed across the band, for a total of 2 kW per 5 MHz of repeater spectrum. This would place SDARS repeaters on a par with the EIRP limitations placed on WCS operators and allow them to operate, as XM admits, 'as a power level that is completely standard in this part of the spectrum.'") *citing* Letter from Bruce D. Jacobs, Counsel to XM Radio Inc., to Magalie Roman Salas, Secretary, FCC, IB Docket No. 95-91, at 2 (filed April 25, 2001); Letter from Paul J. Sinderbrand, Counsel to Wireless Communications Ass'n Int'l, Inc., to Magalie Roman Salas, Secretary, FCC, IB Docket No. 95-91, at 1-2 (filed Jan. 25, 2001); Letter from Paul J. Sinderbrand, Counsel to Wireless Communications Ass'n Int'l, Inc., to Magalie Roman Salas, Secretary, FCC, IB Docket No. 95-91, at 2 (filed Dec. 15, 2000).

[9] The current peak-to-average ratio of DARS repeater technology is 6 dB. *See* Letter from Carl R. Frank, Wiley Rein & Fielding LLP, Counsel to Sirius, to Marlene H. Dortch, Secretary, Federal

In proposing a 2000 watt average EIRP limit for both services, the WCS Coalition is cognizant of the significant problem Sirius has faced as a result of brute force overload or blanketing interference from XM. In prior filings with the Commission, Sirius has complained of "dead zones" – areas in which high-power transmission from XM have caused muting of Sirius' service.[10] Sirius has correctly recognized that where low-powered systems operate in

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Communications Commission, IB Docket No. 95-91, WT Docket No. 03-264, File No. 0002240823, DA 05-1662, WT Docket No. 05-256, Attachment, "White Paper: Interference to the SDARS Service from WCS Transmitters," at 11 (dated Mar. 29, 2006) ["Sirius White Paper"]. However, it is possible that future technologies deployed by XM and Sirius will employ even greater ratios, thus subjecting WCS to even greater potential interference.

[10] *See* Sirius White Paper at 3 ("With a terrestrial network nearly 10 times larger than Sirius', several XM repeaters today generate ground-level "dead zones" – muting reception of the Sirius satellite signal."). The WCS Coalition also recognizes that Sirius has suffered intermodulation interference as a result of the close proximity of its terrestrial repeaters to those of XM. *See id.* While intermodulation will have to be addressed by WCS and DARS licensees as additional facilities are constructed in the coming years, the WCS Coalition does not believe that the Commission should adopt the complex set of rules proposed by Sirius to address collocation of facilities. *See* Sirius Petition at A-2 and B-1 to B-2. Even where the Commission believes that intermodulation interference is possible, it has generally found that "bright line" tests designed to avoid it bare "ill fitting" because of the complex nature of such issues. *Introduction of New Advanced Wireless Services,* Ninth Report and Order and Order, 21 FCC Rcd 4473, 4503 (2006). As a result, the Commission's traditional approach is not to adopt rules that place technical limits on licensees to prevent intermodulation interference from occurring. *See Amendment of Section 90.307(f), Report and Order*, 56 Rad. Reg. 2d (P&F) 1352, ¶ 14 (1984)("Intermodulation interference . . . is best controlled on a case-by-case basis at the actual transmitting site, rather than by a federal restriction on system ERP."). Thus, for example, the Commission recently declined to impose technical limits on commercial Upper 700 MHz Band licensees to minimize intermodulation interference, stating that to do so in the absence of a well-documented showing that serious interference would result "could dramatically compromise the usefulness of the Upper 700 MHz commercial spectrum blocks." *Service Rules for the 746-764 and 776-794 MHz Bands and Revisions to Part 27 of the Commission's Rules,* Third Report and Order, 17 FCC Rcd 13985, 13995-13996 (2002); *id.*, Report and Order and Further Notice of Proposed Rulemaking, FCC 07-72, ¶ 110 (Apr. 27, 2007) ("We also decline to impose any technical restrictions . . . to address potential intermodulation interference . . . ."). Rather than impose rules or other *a priori* restrictions on licensees, the Commission's general policy, absent special circumstances, is to rely on licensees to work out such issues privately: "Typically, intermodulation issues are resolved between licensees, and we believe that is the appropriate approach for dealing with the increased potential for intermodulation products as a result of base station power increases . . . ." *Mobile Satellite Ventures Subsidiary LLC,* Report and Order, 19 FCC Rcd 22144, 22172 (2004).

If the Commission is disposed towards adopting rules that address intermodulation, the Commission should reject aspects of the Sirius proposal that give undue preference to DARS or that preclude WCS licensees with multiple licenses in a given geographic area from utilizing all of their spectrum at a given base station location. The Commission must not allow the system to be gamed in a manner that unduly restricts the ability of WCS licensees to deploy networks that will meet the public's need for additional wireless broadband services.

proximity to high-powered systems, overload is a "significant interference mechanism."[11] Of course, WCS faces the same potential problem – high-powered transmissions from DARS terrestrial repeaters will inevitably cause areas in which WCS low-powered, cellularized wireless broadband services will be unavailable to subscribers. Our proposal responds to that concern by identifying a reasonable middle ground that mitigates,[12] but hardly eliminates, the potential for interference to WCS and DARS satellite reception due to brute force overload.

Furthering the goal of mutuality, the WCS Coalition's proposed rules incorporate a common restriction on out-of-band emissions ("OOBE") for both WCS and DARS fixed transmission facilities, requiring all WCS and DARS licensees to attenuate emissions into the other service's band by a factor of 75 + 10 log (P) dB. Sirius has proposed a similar restriction, and the WCS Coalition is prepared to accept that limit (although we believe it is somewhat overly restrictive).[13]

To The Extent WCS Requires Special Rules Because It Is A Two-Way Service, The Proposed Rules Reasonably Accommodate Both WCS And DARS.

We also have incorporated into our approach Sirius' suggestion that "[w]here mutuality is impractical, the rules [should] provide sufficient flexibility to accommodate the networks and services contemplated in each allocation."[14] The WCS Coalition has previously established that some differences in the rules are inevitable – for example, because WCS is a two-way service while DARS is a one-way service, only the WCS rules will be required to address subscriber transmitters.[15] In those cases where different rules are required, our proposal reflects Sirius'

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[11] *See* Sirius White Paper at 5.

[12] In WT Docket No.03-264, XM had proposed that WCS licensees be permitted to transmit at up to 4000 watts per MHz. *See* Joint Reply Comments of WCS Wireless LLC and XM Satellite Radio Holdings Inc., WT Docket No. 03-264, at 9 (filed Jan. 17, 2006). Sirius vigorously opposed that proposal on the grounds that it would subject its subscribers to "dead zones". *See* Sirius White Paper at 3.

[13] *See* Sirius Petition at B-4.

[14] *Id.* at 2.

[15] *See* WCS Initial Response at 2. Because of the fundamental differences in the two services, Sirius' proposal that average signal strength measurements for both services be taken two meters above ground level is unfairly skewed to favor its particular service (where receivers are generally located close to ground level.) From the perspective of WCS licensees, however, DARS repeaters pose a massive threat to base stations, which will typically be located 20-70 meters above ground level. For the reasons set forth *supra* note 7, the WCS Coalition believes that restrictions on transmit power, rather than average signal strength levels, will best provide for coexistence between the services. However, if the Commission is disposed towards adopting a signal strength limit, that signal strength limit should assure protection of WCS base stations that will be located far above the 2 meter measurement point proposed by Sirius.

view that resulting rules must "accommodate the networks and services contemplated in each allocation."[16]

It is this need to accommodate the subscriber equipment contemplated by WCS licensees that has led the WCS Coalition to propose modifications to the OOBE limits imposed under Sections 27.53(a) of the Commission's Rules on low-powered equipment used in conjunction with WCS operations. As is a matter of record before the Commission, the unusually restrictive OOBE limits imposed a decade ago threaten to undermine the viability of the 2.3 GHz band for wireless broadband services complying with the IEEE 802.16e-2005 standard and other advanced wireless services. This band is being globally harmonized as a home for wireless broadband services, but the WCS Coalition is aware of no other nation that has imposed OOBE restrictions of the sort imposed by the United States. Moreover, although the 2.3 GHz band is in proximity to the 2.5 GHz band that is also being used for wireless broadband, the far more restrictive OOBE limits at 2.3 GHz impose significant impediments to what otherwise would be the relatively simple task of migrating 2.5 GHz band equipment to 2.3 GHz.[17] The net result is that retention of the current OOBE limits will preclude Americans from securing the benefits of the economies of scale that would otherwise be available – at best increasing the cost of service and at worst precluding the realization of the highest and best use of the 2.3 GHz band WCS allocation. None of this should come as a surprise – just last year the Commission acknowledged that the OOBE restrictions set forth in Section 27.53(a) have impeded the emergence of WCS as a viable source of competition in the wireless broadband arena.[18] Indeed, even Sirius has conceded that the current WCS OOBE restrictions are inappropriate.[19]

As the Commission considers revising the OOBE restrictions imposed on WCS licensees, it must remain cognizant of Sirius' absolutely correct acknowledgement that "[b]lanketing interference dominates the impairment mechanism for a receiver incorporating best practice filtering and overload mitigation technology" and that "[i]t can be clearly seen from the typical blanket interference levels that an SDARS receiver will be impaired due to blanketing

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[16] Sirius Petition at 2.

[17] *See* Consolidated Request of WCS Coalition for Limited Extension of Deadline for Establishing WCS Compliance with Section 27.14 Substantial Service Requirement, WT Docket No. 06-102, DA 06-1009, at 4 n.9 (filed Mar. 22, 2006) ["WCS Extension Request"]("These out-of-band emission limits have proven problematic because potential 2.3 GHz band equipment manufacturers have been unable to effectively migrate equipment designed for other bands to WCS.").

[18] As the WCS Coalition made clear at the time, relief from the restrictive OOBE limits currently imposed on WCS is not essential for licensees to meet their revised deadline for providing substantial service. *See* Reply Comments of WCS Coalition to WCS Extension Request, at 12 (filed June 23, 2006). However, revised OOBE rules will go a long way to assuring that the band is used to provide low-cost portable and mobile wireless broadband services, including services based on the IEEE 802.16e-2005 standard.

[19] *See* Sirius White Paper at 5, 17-18.

interference well before it is impaired due to the WCS source out-of- band emissions causing a significant rise in the satellite noise floor."[20] The proposal advanced by the WCS Coalition attempts to mitigate overload interference by appropriately restricting the EIRP of WCS and DARS transmissions. However, because the proposed rules reflect a compromise (and to accommodate DARS permit operations at power levels higher than WCS might like), there will remain some deployment scenarios where overload remains possible. That said, it makes no sense for the Commission to impose unduly restrictive OOBE attenuation requirements on WCS to address scenarios where it is overload, not OOBE that will cause muting of the DARS receiver.

Revisiting the OOBE restrictions imposed on low-powered WCS equipment at this juncture is fully consistent with the Commission's expectations when it adopted those limits a decade ago. In explaining the rationale for the OOBE limits adopted in the initial *Report and Order* in General Docket No. 96-228, the Commission has noted that:

> In authorizing DARS, it was our desire to ensure a high quality radio service. However, a desire for an interference-free radio service must be balanced with the need to provide reasonable operating parameters for adjacent services. Accordingly, our intention in determining out-of-band emission limits for WCS into the spectrum used by DARS has been to limit the potential for interference to a reasonable level -- not to provide a pure, interference-free environment. In determining the out-of-band emission limits adopted in the *Report and Order* we had to take into consideration the wide flexibility that we are providing WCS licensees to provide any services consistent with the Table of Frequency Allocations. *Because we are unable to determine the specific operating parameters of a WCS service until the service is actually implemented, we found it appropriate to adopt limits that take into account any possible system configuration.*[21]

Indeed, following adoption of the OOBE requirements, the Commission has expressly recognized that, because its initial OOBE limits were based on a "worst-case" analysis, relief is appropriate where worst case conditions will not occur. Specifically, the Commission has stated that:

> We recognize, however, that it is possible to provide a reasonable level of protection to DARS by taking into account a specific WCS system, although it may exceed the out-of-band emission limits adopted in the *Report and Order*. A specific system configuration may have certain attributes that were not taken into

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[20] *See id.* at 17.

[21] WCS Reconsideration Order 12 FCC Rcd at 3991(emphasis added).

> account when developing the general emission limits but which reduce its potential to interfere with DARS. For instance, a system may have reduced gain in the direction of Satellite DARS receiver, or the probability of the transmitters of a certain type of WCS system being close enough to interfere with Satellite DARS systems may be very low.[22]

The WCS Coalition's proposal for OOBE relief has been developed with just this in mind. Because the WCS community now has a far better concept of how its spectrum will be used, it can advocate additional restrictions on WCS user stations that are designed mitigate the potential for OOBE interference from WCS to DARS.[23] And, because the proposed rules will permit DARS to permanently deploy repeater networks that will be far different in nature from the very low power "gap-fillers" that were contemplated at the time the original WCS OOBE rules were adopted, and because more is known about DARS receivers, the Commission need not make worst case assumptions regarding DARS susceptibility to OOBE interference.[24]

Specifically, the WCS Coalition is proposing that for user stations transmitting at less than 2 Watts average transmitter output power, and for mobile stations transmitting at less than 2 Watts average EIRP, attenuation of OOBE would be required by a factor of not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz, and between 2341 and 2345 MHz; by a factor of not less than 61 + 10 log (P) dB for frequencies between 2324 and 2328 MHz, and between 2337 and 2341 MHz and by 67 + 10 log (P) between 2328 and 2337 MHz. It must be noted, however, that under our proposal, this more relaxed spectral mask would only be available to those devices that incorporate transmitter power control mechanisms that reduce transmit power to a lower level that is sufficient to accomplish the desired communications.

As mentioned above, this proposal is hardly optimal for WCS. In a perfect world, the Commission would impose upon WCS the same 43 + 10 log (P) dB attenuation requirement that

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[22] *Id.*

[23] For example, proposed Section 27.50(a)(2) will reduce the maximum permissible strength emissions by WCS user stations from the 2000 watts peak EIRP currently permitted to 20 watts average EIRP – a substantial reduction that WCS can accept now that the service deployment plans of WCS licensees are better understood.

[24] When the Commission adopted service rules for DARS in 1997 just prior to the WCS auction, it acknowledged that "some satellite DARS applicants intend to implement, as necessary, terrestrial repeaters, or 'gap-fillers', in urban canyons and other areas where it may be difficult to receive DARS signals transmitted by a satellite." *Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, Report and Order, Memorandum Opinion and Order, and Further Notice of Proposed Rulemaking, 12 FCC Rcd 5754, 5810-12 (1997). *See also Satellite CD Radio, Inc.*, Order and Authorization, 13 FCC Rcd 7971, 7988 n.103 (1997) ("Terrestrial repeaters may be necessary to implement ('gap-fillers') in urban canyons and other areas where it may be difficult to receive SDARS signals transmitted by a satellite.").

governs so many other wireless broadband services both here and abroad.[25] However, the WCS Coalition recognizes the need to provide reasonable protection levels to DARS. Based on the analysis and testing we have conducted to date, the WCS Coalition believes that the relaxed requirements we are proposing for low-power user stations will provide reasonable levels of protection to DARS operations, while providing significant benefits to WCS licensees and their wireless broadband subscribers.

That adoption of the WCS Coalition's proposal would not subject DARS to unreasonable interference can be demonstrated based largely on Sirius' own filings with the Commission. In responding to an XM proposal for a significant increase in the maximum power levels for WCS, Sirius has represented to the Commission that "intermodulation or overload interference impacts satellite service around -54 dBm input power to Sirius or XM SDARS receivers."[26] Under the WCS Coalition's instant proposal, a WCS mobile station would be permitted to operate at a maximum EIRP of 2 watts (or 33 dBm), as opposed to 20W under the current rules. A WCS mobile station operating at maximum permissible power will cause overload interference to a DARS receiver when there is a path loss of 87 dB (33 dBm - (-54 dBm)) from the DARS receiver. Knowing this path loss, we can calculate the OOBE energy from the WCS user station that would impact the DARS receiver's noise floor by 1 dB (a typical industry value for noise floor protection). According to Sirius, the noise floor for its receivers when operating in satellite mode is -111 dBm.[27] This value is consistent with WCS Coalition calculations for a 1 dB noise floor impact, assuming a typical noise figure, thermal noise, and the bandwidth of a Sirius terrestrial emission. Therefore, a WCS user station OOBE of -24 dBm will result in a -111 dBm at the input of the receiver, with 87 dB of path loss between the two devices. This -24 dBm is measured across 4 MHz of receiver bandwidth, and is equivalent to - 30 dBm/MHz. The equivalent OOBE mask to realize this -30 dBm/MHz is 60 + 10 log (P) where P is transmitter power in Watts. Therefore, for a 2 watt EIRP mobile WCS transmitter, the current 110 + 10 log P mask exceeds that which is required to protect a DARS receiver by a margin of 50 dB!

The stepped mask proposed by the WCS coalition for low-powered subscriber equipment requires attenuation of 55 + 10 log (P) in the 4 MHz of the DARS spectrum closest to WCS. Although this is 5 dB less than the 60 + 10 log (P) figure calculated in the preceding paragraph, it must be repeated that to take advantage of the less restrictive mask under our proposal, all devices must use transmit power control to minimize power levels below the maximum permitted. The Commission has recognized that requiring transmitter power control is an

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[25] *See, e.g.* 47 C.F.R. §22.917(a)(Cellular Mobile Service); §24.238(a)(Broadband Personal Communications Service), § 27.53(j)(1670-1675 MHz); § 90.1323 (3650-3700 MHz).

[26] *See* Sirius White Paper at 17.

[27] *See id.*

effective mechanism for minimizing interference.[28] In the instant case, modeling by a member of the WCS Coalition indicates that mobile WCS transmitters will operate at least 5 dB below maximum authorized power 90% of the time.

While the requirement for transmit power control alone validates the OOBE limits that the WCS Coalition is proposing, there are a variety of other factors that the Commission can and should consider as it moves away from the worst case analysis it undertook when little was known of WCS and DARS to a more realistic assessment of possible OOBE interference. For example, now that DARS has deployed its terrestrial repeater networks, we can see that the prospects for OOBE interference from WCS to DARS are substantially mitigated by the multiple diversity path system design employed by both DARS licenses. XM and Sirius both transmit two identical satellite signals, plus an identical repeater signal. Muting does not occur unless all three signals are impaired.[29] Sirius has conceded that because of this system design, it can accept levels of interference, so long as marginal levels of one signal allow continued service to a user.[30] Thus, even in those rare occasions where OOBE interference to one of the satellite streams occurs (and the DARS receiver does not otherwise mute due to overload), it is likely that one of the other three streams will be available and that muting of the signal will not occur.

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[28] *See Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) devices in the 5 GHz band*, Report and Order, 18 FCC Rcd 24484, 24499 (2003); *on recon.* Memorandum Opinion and Order, 21 FCC Rcd 7672, 7675 (rel. June 30, 2006); *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands,* Report and Order and Notice of Proposed Rulemaking, 18 FCC Rcd 1962, 1993, 2021 n.306 (2003) ["*MSS/ATC Report and Order*"]; *Revisions to Broadcast Auxiliary Service Rules in Part 74 and Conforming Technical Rules for Broadcast Auxiliary Service, Cable Television Relay Service and Fixed Services in Parts 74, 78 and 101 of the Commission's Rules*, Report and Order, 17 FCC Rcd 22979, 22999 (2002); *Facilitating Opportunities For Flexible, Efficient, And Reliable Spectrum Use Employing Cognitive Radio Technologies*, Report and Order, 20 FCC Rcd 5486, 5489-90 (2005).

[29] Although the WCS Coalition recognizes that terrestrial repeater signals do not blanket the entire United States, one need only look at the over 1,000 repeaters XM and Sirius have deployed to see that most urban areas of any size, and their surrounding suburbs, are well served with terrestrial repeaters. In all likelihood, the areas in which there are the most WCS base stations will also be the areas where DARS terrestrial service is available. And, of course, DARS is free under the rules being proposed by the WCS Coalition to add new repeaters freely. Thus, the availability of a terrestrial signal to most DARS subscribers when they are likely in going to be in proximity to a potential WCS interferer cannot be ignored.

[30] *See* Sirius Petition at 5. Like the Sirius White Paper, the Sirius Petition is flawed by its failure to consider the of widespread terrestrial repeater deployments on the potential for interference from WCS. Because repeater signal levels are generally far stronger than satellite signal levels, and because it is now clear that XM and Sirius intend to blanket much of the population with terrestrial repeater signals, the protection to DARS receivers must take the likely availability of a terrestrial repeater signal into account, rather than merely assuming worst-case satellite serving conditions.

Although not apparent when the Commission first adopted its WCS OOBE requirements, it is now clear that other factors also will be present that mitigate the probability of OOBE interference from WCS to DARS. For example:

- Now that the Commission has a better sense of how WCS will be utilized, it is clear that in most cases a WCS subscriber unit will not be transmitting at the same time it is in close proximity to a DARS receiver (particularly without attenuation between the two caused by bodies, walls or automobile bodies). In relaxing the OOBE restrictions on WCS operators employing portable Personal Access Communications Service ("PACS") technology, the Commission recognized that PACS generally would not operate within twelve feet of a DARS receiver.[31] More recently, in permitting Mobile Satellite Service Ancillary Terrestrial Component ("ATC") operations, the Commission recognized that it would be inappropriate to assume that ATC and PCS handsets are operating in close proximity under line-of-sight conditions.[32] It is similarly fair to assume here that a WCS subscriber generally will not be transmitting in close proximity to a DARS subscriber, at least not with an unobstructed path between the two.

- DARS receivers include long-duration interleavers that buffer short-term interruptions in signal receptions (such as when a car drives under a bridge or into a tunnel). Because WCS subscriber transmissions will tend to be extremely short, any interference from a WCS subscriber unit that happens to be in close proximity to a DARS receiver that happens to be in the satellite reception mode will likely be of a shorter duration than the buffer capacity, meaning that the DARS subscriber will not suffer any interruption in his or her listening.

- Given the complex, reflection-filled urban and suburban environments in which WCS and DARS subscriber equipment will most likely be operating when in proximity to one another, it is highly likely that there will be polarization mis-match. Moreover, it is highly unlikely that proximate subscriber equipment will be perfectly aligned. Thus, as it has done in similar situations, the Commission can and should assume that there will often be polarization and angular discrimination when

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[31] *See WCS Reconsideration Order,* 12 FCC Rcd at 3993.

[32] *See MSS/ATC Report and Order*, 18 FCC Rcd at 2026. *See also Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems,* Order on Reconsideration, 21 FCC Rcd 5606, 5629(2006).

evaluating the potential for interference from WCS subscriber transmissions to DARS consumer receivers.[33]

The Commission Should Require XM And Sirius To Conform To Final Terrestrial Repeater Rules Within One Year.

While the WCS Coalition has attempted to align its positions to the greatest extent possible with those in the Sirius Petition, the WCS Coalition must once again reiterate its opposition to Sirius' proposal for "grandfathering" the repeaters that the DARS licensees have constructed pursuant to special temporary authorizations ("STAs").[34] The opposition of the WCS industry to grandfathering all current terrestrial repeaters is well-documented, and the arguments against exempting those repeaters from the final Part 25 rules need not be repeated here.[35] Suffice it to say that nothing in the Sirius Petition alters the WCS Coalition's view that the DARS licensees should not be permitted to operate those repeaters *ad infinitum* unless they also remain subject to their current obligation to cure any interference that may be caused to future WCS deployments.[36] In the past, the DARS interests have expressed a willingness to transition the facilities they have constructed pursuant to STAs to comply with whatever new rules the Commission adopts.[37] The proposed rules set forth in Exhibit A would provide XM

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[33] *See id.* (acknowledging the importance of considering angular and polarization discrimination in considering the possibility of interference).

[34] *See* Sirius Petition at 6 ("In order to preserve the service expectations of current subscribers, however, the rules [proposed in the Sirius Petition] permit grandfathering of existing terrestrial transmitters in both services."). Indeed, Sirius even goes so far as to propose that DARS licensees be permitted to freely relocate their grandfathered repeaters within 3 kilometers of current sites, even if such relocation causes increased interference to WCS. *See id.* at A-2.

[35] *See* WCS Initial Response at 3; Petition of BellSouth Mobile Data Inc. and BellSouth Wireless Cable, Inc. to Dismiss or Deny, File No. SAT-STA-20060623-00067 (filed Sept. 18, 2006); Petition of NextWave Broadband Inc. to Deny, File No. SAT-STA-20060623-00067 (filed Sept. 18, 2006); Petition of the WCS Coalition to Deny, File No. SAT-STA-20060623-00067 (filed Sept. 18, 2006); Reply of BellSouth Mobile Data Inc. and BellSouth Wireless Cable, Inc. to Opposition of Sirius Satellite Radio Inc. to Petition to Dismiss or Deny, File No. SAT-STA-20060623-00067 (filed Oct. 16, 2006); Reply of NextWave Broadband Inc. to Opposition to Petition to Deny, File No. SAT-STA-20060623-00067 (filed Oct. 16, 2006); Reply of the WCS Coalition, File No. SAT-STA-20060623-00067 (filed Oct. 16, 2006).

[36] *See Sirius Satellite Radio, Inc.*, Order and Authorization, 16 FCC Rcd 16773, 16779 (2001) *modified on recon.* Order, 16 FCC Rcd 18481 (2001); *XM Radio Inc.,* Order and Authorization, 16 FCC Rcd 16781, 16787 (2001); *XM Radio Inc.,* Order and Authorization, 19 FCC Rcd 18140, 18143 (2004).

[37] *See, e.g.* Letter from Mary N. O'Connor, Counsel to Wireless Communications Ass'n Int'l, Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission, IB Docket No. 95-91 (filed Nov. 13, 2003)(reporting on joint meeting of WCS and DARS licensees with Commission staff, and including materials jointly prepared and distributed by WCS and DARS licensees that advised the Commission that "Transition period for making changes" was a topic under consideration during negotiations.).

and Sirius a twelve month transition period to bring their deviant repeaters into compliance with the new rules. This transitional period should be more than sufficient to minimize disruption to DARS consumers while enabling WCS licensees to commence deployment and initiate new advanced wireless services.

The WCS Coalition Agrees With Sirius That Parts 25 And 27 Should Be Amended Simultaneously.

Finally, the Commission must not lose sight of the fact that, with the coming emergence of standards-based wireless broadband technologies for the 2.3 GHz band, WCS is poised to become a primary vehicle for the delivery of wireless broadband services to American consumers. The band is already being used for wireless broadband deployments around the globe,[38] and the potential for America to keep pace will be lost unless the Commission soon adopts rules that provide for the reasonable coexistence of WCS and DARS. Sirius has proposed that the modifications to Part 25 and to Part 27 necessary to facilitate the coexistence of the two services "be concluded simultaneously."[39] As the WCS Coalition has consistently advised the Commission, we agree and urge the Commission to proceed without delay.[40]

Should you have any questions regarding this submission, please contact the undersigned.

Respectfully submitted,

/s/ Paul J. Sinderbrand

Paul J. Sinderbrand

Counsel to the WCS Coalition

cc: Hon. Kevin J. Martin
Hon. Michael J. Copps
Hon. Jonathan S. Adelstein
Hon. Deborah Taylor Tate
Hon. Robert M. McDowell

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[38] Most famously, the 2.3 GHz band is being utilized in South Korea for the WiBro service based on IEEE 802.16 standards.

[39] *See* Sirius Petition at 4 n.9.

[40] *See* WCS Extension Request at 3 n.3 ("the WCS Coalition agrees that the Commission should consider all of the issues surrounding interference between and among WCS and DARS licensees (including appropriate power levels and spectral masks for both services) on a consolidated basis."); WCS Initial Response at 3-4.

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EXHIBIT A

DRAFT MODIFICATIONS TO PARTS 25 AND 27

Proposed Revisions to Part 27

§ 27.50 Power and antenna height limits.

(a) The following power limits apply to the 2305–2320 MHz and 2345–2360 MHz bands:

(1) Base stations, fixed stations and radiolocation land stations transmitting are limited to 2000 watts average equivalent isotropically radiated power (EIRP) per 5 MHz and 400 watts average EIPR per 1 MHz.

(2) User stations are limited to 20 watts average EIRP.

(3) Average EIRP shall be calculated utilizing the average power of the transmitter measured in accordance with the definition of mean power in § 2.1 of this chapter.

§ 27.53 Emission limits.

(a) For operations in the bands 2305–2320 MHz and 2345–2360 MHz, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by the following amounts:

(1) By a factor not less than 75 + 10 log (P) dB on all frequencies between 2320 and 2345 MHz;

(2) Notwithstanding §27.53(a)(1) of this chapter, for non-mobile user stations transmitting less than 2 Watts average transmitter output power, and for mobile stations transmitting less than 2 Watts average equivalent isotropically radiated power (EIRP), by a factor of not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324MHz, and between 2341 and 2345 MHz; by a factor of not less than 61 + 10 log (P) dB for frequencies between 2324 and 2328 MHz, and between 2337 and 2341 MHz and by 67 + 10 log (P) dB between 2328 and 2337 MHz. All stations employing this less restrictive spectrum mask in lieu of that set forth in §27.53(a)(1) of this chapter shall incorporate a transmit power control mechanism to lower the output power from the maximum permitted power to a lower level sufficient to accomplish the desired communications.

(3) By a factor not less than 70 + 10 log (P) dB on all frequencies below 2300 MHz and on all frequencies above 2370 MHz; and not less than 43 + 10 log (P) dB on

all frequencies between 2300 and 2320 MHz and on all frequencies between 2345 and 2370 MHz that are outside the licensed bands of operation;

(4) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured energy is integrated over the full required measurement bandwidth (i.e., 1 MHz or 1 percent of emission bandwidth, as specified. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power

(5) In complying with the requirements in §27.53(a)(1) and §27.53(a)(2) of this chapter, WCS equipment that uses opposite sense circular polarization from that used by Satellite DARS systems in the 2320–2345 MHz band shall be permitted an allowance of 10 dB;

(6) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the edges, both upper and lower, of the licensee's bands of operation as the design permits;

(7) Waiver requests of any of the out-of-band emission limits in paragraphs (a)(1) through (a)(6) of this section shall be entertained only if interference protection equivalent to that afforded by the limits is shown;

(8) The out-of-band emissions limits in paragraphs (a)(1) through (a)(9) of this section may be modified by the private contractual agreement of all affected licensees, who shall maintain a copy of the agreement in their station files and disclose it to prospective assignees or transferees and, upon request, to the Commission.

(b) For WCS Satellite DARS operations: The limits set forth in §25.202(f) of this chapter shall apply, except that Satellite DARS operations shall be limited to a maximum power flux density of -197 dBW/m2/4 kHz in the 2370–2390 MHz band at Arecibo, Puerto Rico.

Proposed Revisions to Part 25

25.xx Technical rules for SDARS repeater stations operating in the 2320-2345 MHz band

(a) SDARS repeater stations are limited to 2000 watts average equivalent isotropically radiated power (EIRP) per 5 MHz and 400 watts average EIPR per 1 MHz.

(b) The power of any emission outside the SDARS repeater station's licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by a factor not less than 75 + 10 log (P) dB.

(c) Out of band emissions shall be measured as in §27.53(a)(4) of this chapter.

(d) SDARS repeater stations operating pursuant to special temporary authority prior to [date of release of Report and Order adopting final rules] that do not comply with the provisions of this § 25.xx may continue to operate as authorized until [date that is one year after date of release of Report and Order adopting final rules].